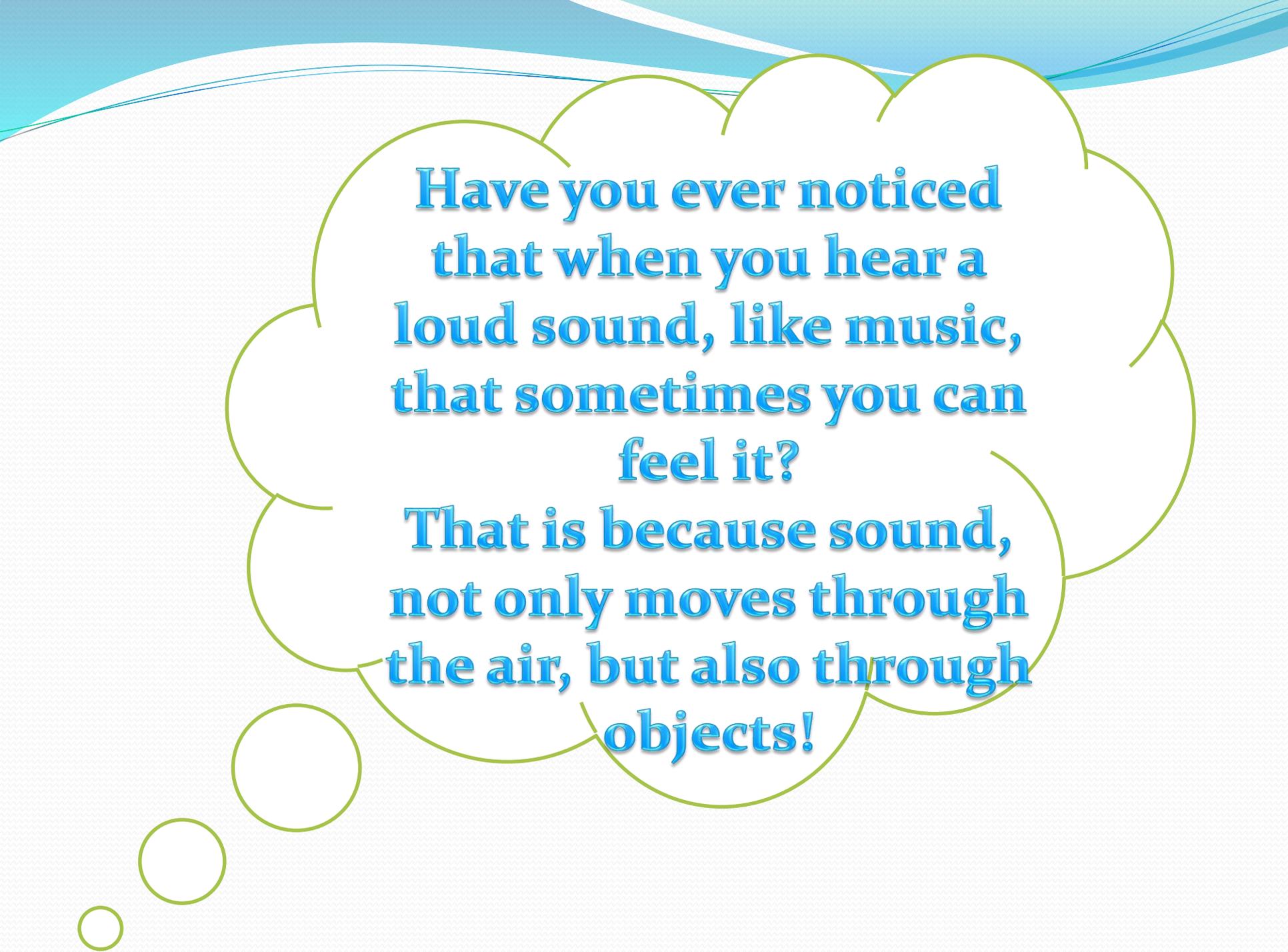


# Introduction to Sound Waves and Vibration

ExploreLabScience



**Have you ever noticed  
that when you hear a  
loud sound, like music,  
that sometimes you can  
feel it?**

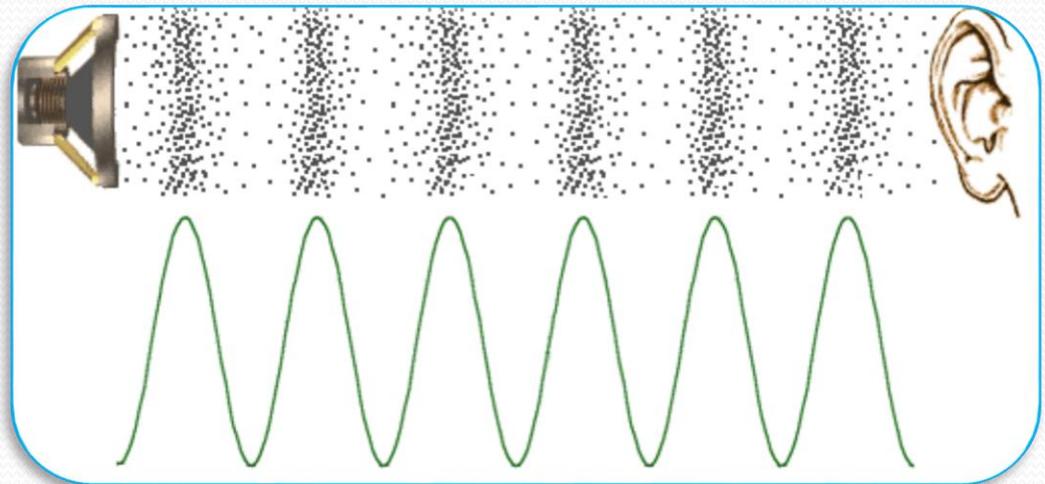
**That is because sound,  
not only moves through  
the air, but also through  
objects!**

# What is Sound?

Sound is a **wave**. A wave is some disturbance caused when **energy** is traveling from one object to another.

When sound travels, it moves the air around it, creating high and low **pressure** points, or waves.

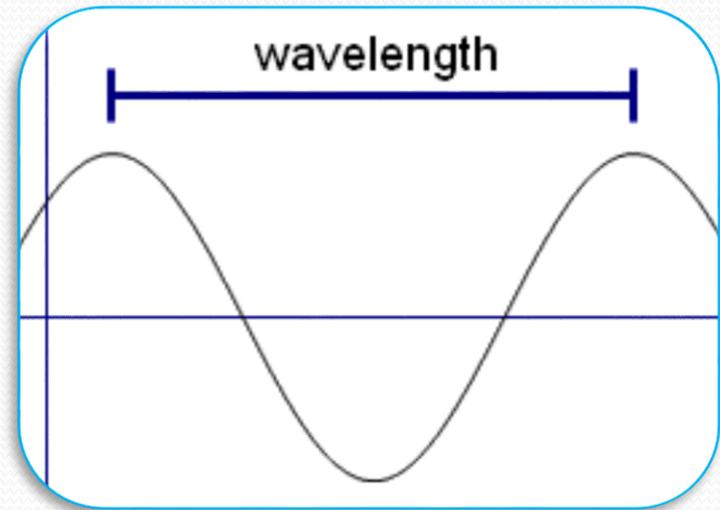
Your ears can detect the waves, and you perceive this as sound.



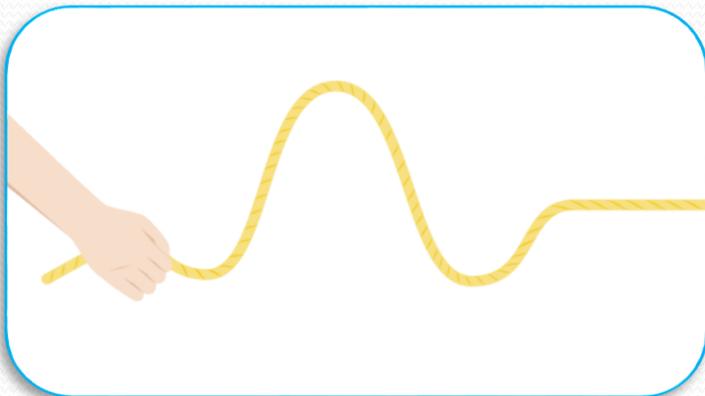
# Wavelength

Waves tend to behave in predictable ways. One of their **properties** is **wavelength**.

Wavelength is simply how long each wave is.



To demonstrate wavelength, have two people hold each end of a string. One person can wave their arm up and down at a consistent speed.



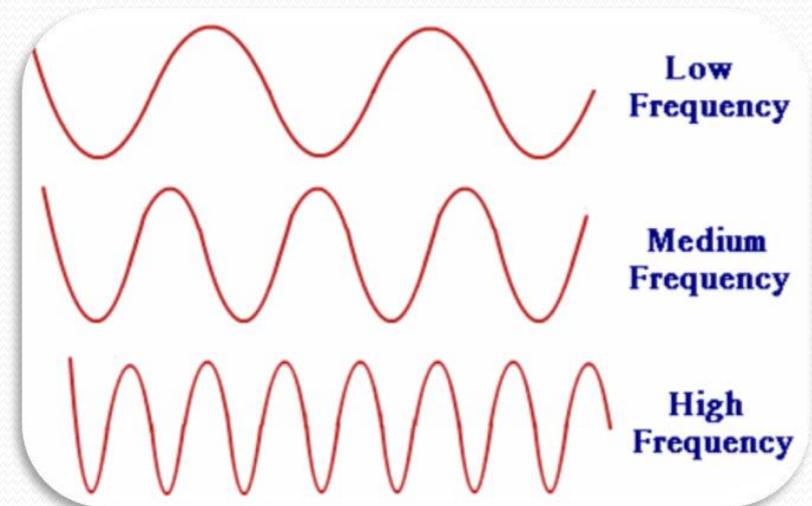
- Can you estimate the wavelength, in terms of feet?
- When you move your arm faster, what happens to the frequency?
- What about to the wavelength?

# Frequency

You probably noticed that when you move your arm faster, the waves get smaller and increase in number along the string.

And that is because you have just increased the frequency of the waves!

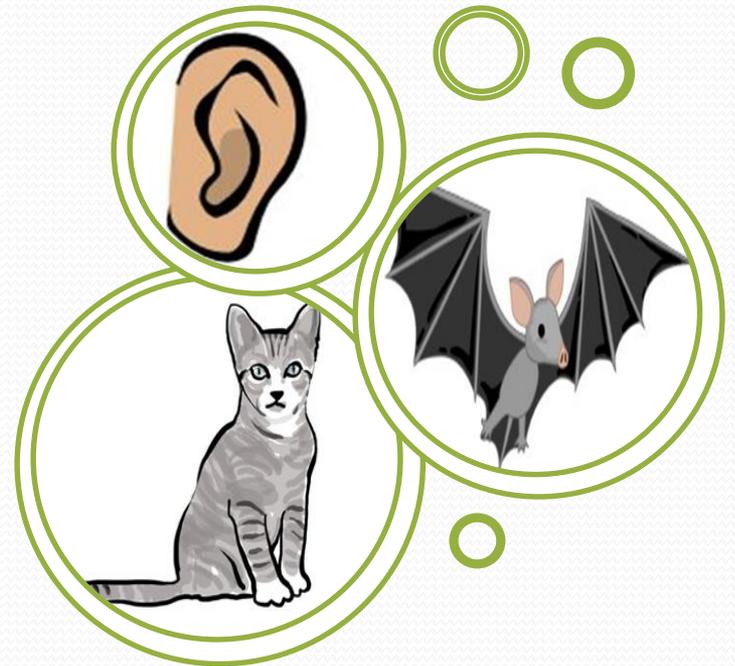
The **frequency** of sound is the number of waves that occur in a certain length of time.



# Human Hearing

Human hearing is limited in the frequencies of sound it can detect. There are many animals that can hear noises that we cannot!

For example, cats can detect frequencies that are much lower, while bats can detect frequencies that are much higher than those we can hear.



# String Telephone

Back to our experiment: when you spoke into the cup the sound waves from your voice were **transformed** into vibrations, which traveled along the string. They were then converted back into sound waves in the cup at the other end.





# What is Vibration?

**Vibration** is a wave too, but it is different from sound waves. This wave is **energy** traveling through objects instead of air, which is how you can sometimes “feel” a loud noise.

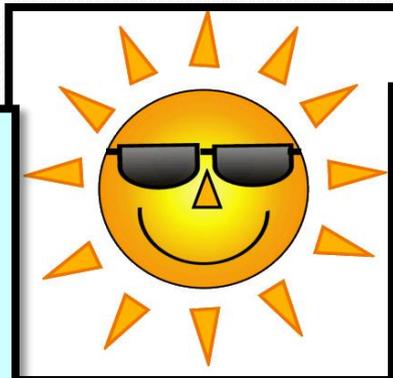
In the string, the vibrations held the same wavelength and frequency of the original sound wave made by your voice, which is how your friend could hear it at the other end.

When you grab the string while it is vibrating, the wave is stopped from continuing to the other cup and your voice cannot be heard.

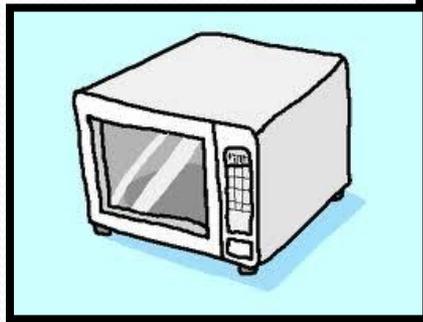
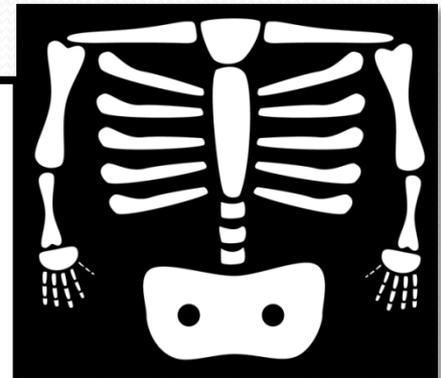
# Applications of Waves

There are so many more types of waves and each one has been studied intensely in labs and used to improve every day life!

Polarized waves



X rays



Microwaves



Radio waves

# References

- <http://physics.tutorvista.com/waves/wave-frequency.html>
- <http://www.physicsclassroom.com/class/sound/Lesson-1/Sound-is-a-Pressure-Wave>
- <http://www.bbc.co.uk/education/guides/zq4tyrd/revision>